

We claim:

1. A method of forming a lithographic template comprising the steps of:
providing a substrate, the substrate having an uppermost surface;
5 providing a patterning layer supported by the substrate; and
patterning the patterning layer with a radiation source thereby forming a
patterned imageable relief layer having a relief structure.

2. A method for forming a lithographic template as claimed in claim 1, wherein
10 the step of providing a substrate is further characterized as providing a substrate of one
of a semi-transparent material or a transparent material.

3. A method of forming a lithographic template as claimed in claim 2 further
including the step of providing a charge dissipation layer adjacent the patterning layer,
15 the patterning layer and the charge dissipation layer formed on the surface of the
substrate.

4. A method of forming a lithographic template as claimed in claim 3 wherein the
step of providing a charge dissipation layer adjacent the patterning layer includes
20 forming the charge dissipation layer on an uppermost surface of the patterning layer,
the patterning layer formed on the uppermost surface of the substrate.

5. A method of forming a lithographic template as claimed in claim 4 wherein the
step of providing a charge dissipation layer includes forming the charge dissipation

layer of a material chosen from the group consisting of: aluminum (Al), copper (Cu), polyaniline, and a charge dissipating conducting material.

6. A method of forming a lithographic template as claimed in claim 4 further
 5 including the step of forming a contrast enhancement layer between the substrate and the patterning layer.

7. A method of forming a lithographic template as claimed in claim 6 wherein the
 contrast enhancement layer is a material chosen from the group of chrome oxide (CrO),
 10 chrome nitride (CrN), titanium oxide (TiO), aluminum oxide (Al_2O_3), or aluminum nitride (AlN), or combinations thereof.

8. A method of forming a lithographic template as claimed in claim 3 wherein
 the step of providing a charge dissipation layer adjacent the patterning layer includes
 15 forming the charge dissipation layer between the substrate and the patterning layer.

9. A method of forming a lithographic template as claimed in claim 8 wherein
 the step of providing a charge dissipation layer includes forming a charge dissipation
 layer of a material chosen from the group consisting of: indium-tin-oxide (ITO), indium
 20 oxide, tin oxide, zinc oxide, cadmium oxide, copper aluminum oxide, copper gallium
 oxide, cadmium tin oxide, a transparent conducting material, a semi-transparent
 conducting material, and combinations thereof.

10. A method of forming a lithographic template as claimed in claim 9 wherein step of forming the charge dissipation layer between the substrate and the patterning layer includes forming the charge dissipation layer to include contrast enhancement properties.

5

11. A method of forming a lithographic template as claimed in claim 1 wherein the patterning layer is formed of an imageable transparent dielectric.

12. A method of forming a lithographic template as claimed in claim 11 wherein the imageable transparent dielectric is an imageable oxide.

10

13. A method of forming a lithographic template as claimed in claim 12 wherein the imageable oxide is hydrogen silsesquioxane (HSQ).

14. A method of forming a lithographic template as claimed in claim 11 wherein the imageable transparent dielectric is an imageable nitride.

15

15. A method of forming a lithographic template as claimed in claim 11 wherein the imageable transparent dielectric is an imageable oxynitride.

20

16. A method for forming the lithographic template as claimed in claim 11 wherein the step of patterning the patterning layer includes patterning with an electron beam source.

17. A lithographic template comprising:

a substrate having an uppermost surface; and

a patterned imageable relief layer defining a relief structure supported by the uppermost surface of the substrate.

5

18. A method of forming a lithographic template as claimed in claim 17 wherein the substrate is formed as one of a transparent substrate or an opaque substrate.

19. A lithographic template as claimed in claim 18 wherein the transparent substrate is further characterized as one of a quartz material, a polycarbonate material, a calcium fluoride (CaF_2) material, a magnesium fluoride (MgF_2) material, or a pyrex material.

20. A lithographic template as claimed in claim 17 further including a charge dissipation layer formed between the substrate and the patterned imageable relief layer.

21. A method of forming a lithographic template as claimed in claim 20 wherein the charge dissipation layer includes contrast enhancement properties.

20

22. A lithographic template as claimed in claim 20 wherein the charge dissipation layer is formed of a transparent conducting oxide.

23. A lithographic template as claimed in claim 22 wherein the charge dissipation layer is formed of a material chosen from the group consisting of: indium-tin-oxide (ITO), indium oxide, tin oxide, zinc oxide, cadmium oxide, copper aluminum oxide, copper gallium oxide, cadmium tin oxide, and combinations thereof.

5

24. A lithographic template as claimed in claim 17 further including a contrast enhancement layer formed between the substrate and the patterned imageable relief layer.

25. A lithographic template as claimed in claim 17 wherein the patterned imageable relief layer is formed of an imageable transparent dielectric material.

26. A lithographic template as claimed in claim 25 wherein the imageable transparent dielectric material is an imageable oxide.

27. A lithographic template as claimed in claim 25 wherein the imageable oxide is hydrogen silsesquioxane (HSQ).

28. A lithographic template as claimed in claim 25 wherein the imageable transparent dielectric material is an imageable nitride.

29. A lithographic template as claimed in claim 25 wherein the imageable transparent dielectric material is an imageable oxynitride.

30. A method for making a device comprising the steps of:

providing a substrate;

coating the substrate with a material layer characterized as deformable in

5 response to a pressure applied thereto;

fabricating a lithographic template, wherein the lithographic template comprises;

a substrate having an uppermost surface; and

a patterned imageable relief layer defining a relief structure supported by
the uppermost surface of the substrate;

10 positioning the lithographic template in contact with the material layer, the
material layer being between the template and the substrate;

applying pressure to the template, the material layer thereby deforming into the
relief pattern on the template; and

removing the template from the substrate.

15 31. A method for making a device as claimed in claim 30 wherein the material
layer is a radiation sensitive material layer.

32. A method for making a device as claimed in claim 30 wherein the radiation
20 sensitive material layer is further characterized as a photocurable material layer.

33. A method for making a device as claimed in claim 30 further including the
step of transmitting radiation through the lithographic template to expose at least a

portion of the radiation sensitive material layer on the substrate, thereby further affecting the pattern in the radiation sensitive material layer

34. A method for making a device as claimed in claim 33 wherein the step of
5 transmitting radiation through the lithographic template is further characterized as transmitting ultraviolet light through the lithographic template.

35. A method for making a device as claimed in claim 33 wherein the step of
10 transmitting radiation through the lithographic template is further characterized as transmitting deep ultraviolet light through the lithographic template.

36. A method for making a device as claimed in claim 30 wherein the device is
one of a semiconductor device, a microelectronic device, a micro electro mechanical
device, a photonic, an optoelectronic, or a microfluidic device.